Photovoltaic Module User Manual

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Overview

Thank you very much for using Jinko Solar PV modules. In order to enable the PV module to be installed correctly and to generate electric power properly, please read the following operation instructions carefully before installing and using the modules.

Please remember that you are operating a product that generates electricity, and therefore certain safety measures need to be implemented in order to avoid accidents.

Applicable Products

This document is applicable to Jinko Solar JKM175M-72 series, JKM220M-60 series and JKM220P-60 series solar module productions.

Make sure the modules are arranged so that the current and voltage characteristics of the array are within the tolerances of the device to which the array will connect. Modules sold in Europe rate up to 1000V.

This module has a Class A Fire Rating and must be installed over a roof of appropriate fire resistance. Consult your local building department to determine approved roofing materials.

Warning:

a) Artificially concentrated sunlight shall not be directed on the module or panel.

b) Solar modules have a protective glass front. Broken solar module glass is an electrical safety hazard (electric shock and fire). These modules cannot be repaired and should be replaced immediately.

Warning	**Electric Shock and Burn Hazard** This photovoltaic module produces Electricity when exposed to the sun or other light sources.

c) Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the value of Isc and Voc marked on this module should be multiplied by 1.25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output.
d) To reduce the risk of electrical shock or burns, modules may be covered with an opaque material during installation to avoid shocks or burns.
e) The installation work of the PV array can only be done under the protection of sun-sheltering covers or sunshades and only qualified person can install or perform maintenance work on this module.
f) Follow the battery manufacture's recommendations if batteries are used with modules.
g) Do not install this module to substitute –even partially- a roof or wall of a habitable structure.
h) Do not artificially concentrate sunlight on modules.
i) Do not install modules where flammable gas may be present.
j) Do not touch live terminals with bare hands. Use insulated tools for electrical connections.
k) Do not remove any part installed by Jinko Solar or disassemble the module.
l) All instructions should be read and understood before attempting to install, wire, operate and maintain the module.

Unpacking

Once the PV module has been shipped to the installation site all of the parts should be unpacked properly with care.

Caution: The environment for unpacking the modules and all other apparatus should be proofed against dampness and rainfall.

Preparation before Installation

a) Visual check before installation, to make sure there is no bug in the packing and junction box as well as the surface of module.
b) Check the series number
c) Check the solar cell modules with irradiance of more than 600W/m^2 and get the voltage. In case the voltage is ZERO, it should NOT be installed and please contact the supplier.
d) Tools & Material for Installation
   i. Screwdriver
   ii. Clamp
   iii. For each installation hole, there should be a screw (M6*20), gasket and screw cap, all made of stainless iron.
   iv. Each solar cell module should be with 2Φ3.5*15 stainless screw with round-head.
   v. The users should design and build metallic bracket for installing and bearing the weight of the PV modules. The brackets are specially designed for users' installation places such as the open land or on the roof of houses.

Caution: It is recommended to place the module in a gradient angle facing the sun, in order to insure maximum irradiation, and also to avoid damage from flooding and other unpredictable events, such as heavy impacts.

Installation and operation

a) Systems should be installed by qualified personnel only and at least by two persons. The system involves electricity, and can be dangerous if the operators are not familiar with the appropriate safety procedures.
b) Do not step on the module.
c) Although modules are quite rugged, the glass can be broken (and the module will no longer work properly) if it is dropped or hit by tools or other objects.
d) Mounting of module:
   i. Solar modules can be mounted using the four mounting holes located on the solar modules frame or may also be mounted using pressure clips that compress the frame from the top to the mounting rail (Figure 1). The mounting rails must be within one inch (1") [2.54 cm] of the frame mounting holes (Figure 2) and run perpendicular to the length of the module. Secure the module using the four mounting holes provided and 2Φ3.5*15 stainless screw with round-head. Lock washers should be used with this hardware for long-term security.

Caution	Improper mounting of solar modules can lead to the frame separating from the glass, the glass breaking, and/or the solar module (or component used to construct the solar module) may become a falling object.

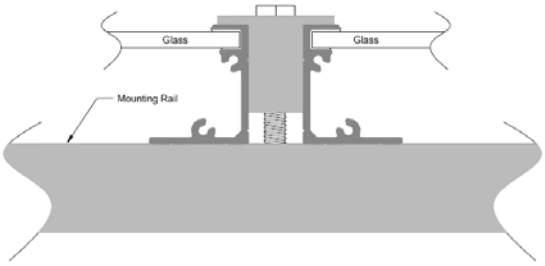

Figure 1: Typical pressure clamp

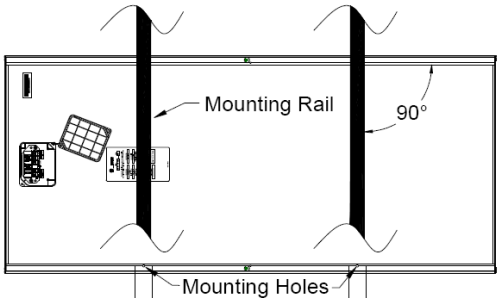

Figure 2: Mounting and placement

ii. Put the solar modules on the frame, put on the screws and then combine them firmly after put on all the gaskets. All the screw caps should be finished on the frame together firmly. The module frame is made of anodized aluminum, and therefore corrosion can occur if the module is subject to a salt-water environment with contact to a rack of another type of metal. (Electrolysis Corrosion). PVC or stainless steel washers can be placed between the solar module frame and support structure to prevent this corrosion.

iii. Module support structures that are to be used to support modules should be wind rated and approved for use by the appropriate local and civil codes prior to installation.

e) When solar modules are used to charge batteries, the battery must be installed in a manner, which will protect the performance of the system and the safety of its users. Follow the battery manufacturer's guidelines concerning installation, operation and maintenance recommendations. In general, the battery (or battery bank) should be away from the main flow of people and animal traffic. Select a battery site that is protected from sunlight, rain, snow, debris, and is well ventilated. Most batteries generate hydrogen gas when charging, which can be explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it should be placed in an insulated and ventilated battery case specifically designed for the purpose.

f) In most applications, PV modules should be installed in a location where they will receive maximum sunlight throughout the year. In the Northern Hemisphere, the modules should typically face south, and in the Southern Hemisphere, the modules should typically face north. Modules facing 30 degrees away from true South (or north) will lose approximately 10 to 15 percent of their power output. If the module faces 60 degrees away from true South (or North), the power loss will be 20 to 30 percent. When choosing a site, avoid trees, buildings or obstructions,

which could cast shadows on the solar.

Wiring and Connection

a) Before this procedure, please read the operation instructions of the PV control system carefully. Make wiring by Multi-connecting cables between the PV modules in series or parallel connection, which is determined by user's configuration requirement for system power, current and voltage.
b) PV module connected in series should have similar voltage. Modules must not be connected together to create a voltage higher than the permitted system voltage according protection class A
c) PV module connect in parallel should have similar current. Do not connect module in parallel without using connection box.
d) Open the connection box of the control system and connect the cabled from the PV arrays to the connection box in accordance with the installation indication of the PV control systems.
e) All module frames and mounting racks must be properly grounded in accordance with local and national electrical codes. Attach the equipment grounding conductor to the module frame using the hole and hardware provided. Note that a stainless steel star washer is used between the ground wire and the module frame (see picture below). This washer is used to avoid corrosion due to dissimilar metals. Tighten the screw securely.

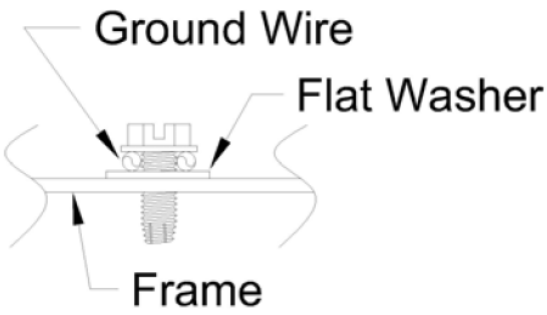

Figure 3 The graph of Grounding

f) Follow the requirements of applicable local and national electrical codes.

Maintenance and Care

a) A built up of dust or dirt on the module(s) front face will result in a decreased energy output. Clean the panel(s) preferably once per annum if possible (dependant on site conditions) using a soft cloth dry or damp, as necessary.
b) Never use abrasive material under any circumstances.
c) Examine the PV module(s) for signs of deterioration. Check all wiring for possible

rodent damage, weathering and that all connections are tight and corrosion free. Check electrical leakage to ground.

d) Check fixing screws and mounting brackets are tight, adjust and tighten as necessary.

Electrical specifications

The module electrical rating are measured under Standard Test Conditions, which are 1000K/m2 irradiance with AM 1.5 spectrum and 25degC cell temperature. The module might produce more or less voltage or current than rating value in uncertainty condition. Accordingly, the values of I_{SC} and V_{OC} marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output. Table below are electrical characteristics at STC.

Module Type	Max Power (Wp)	Max Power Voltage (Vm)	Max Power Current (Im)	Open Circuit voltage (Voc)	Short Circuit Current (Isc)	Overall dimensions (mm)	Max series Fuse (A)	Weight (kg)
JKM155M-72	155	35	4.43	42	4.96	1580*808*45	10	15.5
JKM160M-72	160	35	4.57	42	5.12			
JKM165M-72	165	35	4.71	42	5.28			
JKM170M-72	170	35.5	4.79	42.6	5.36			
JKM175M-72	175	35.5	4.93	42.6	5.52			
JKM180M-72	180	36	5.00	43.2	5.6			
JKM185M-72	185	36	5.14	43.2	5.76			
JKM200M-96	200	46	4.34	55.2	4.86	1582*1082*50	15	22
JKM205M-96	205	46.5	4.41	55.8	4.94			
JKM210M-96	210	47	4.47	56.4	5.01			
JKM215M-96	215	47.5	4.53	57	5.07			
JKM220M-96	220	48	4.58	57.6	5.13			
JKM225M-96	225	48	4.69	57.6	5.25			
JKM230M-96	230	48	4.79	57.6	5.36			
JKM235M-96	235	48	4.89	57.6	5.48			
JKM240M-96	240	48	5	57.6	5.6			
JKM200P-60	200	28.5	7.02	34.2	7.86	1650*992*50	15	19.5
JKM205P-60	205	28.5	7.19	34.2	8.05			
JKM210P-60	210	29	7.24	34.8	8.11			
JKM215P-60	215	29	7.41	34.8	8.13			
JKM220P-60	220	29.5	7.46	35.4	8.36			
JKM225P-60	225	29.5	7.63	35.4	8.55			
JKM230P-60	230	30	7.67	36	8.59			